Characterizing CubeSat Deployer Dynamics in a Microgravity Environment

Problem Statement

- The Nano-Launch Vehicle CubeSat Deployer (NLV CD) and Poly-Picosatellite Orbital Deployer (P-POD) deployment dynamics have never been accurately characterized in an operational environment.
- Parabolic flights will provide an understanding of internal dynamic interactions in microgravity.
- Potential beneficiaries of the characterization are NASA LSP, ARC, JPL, GSFC, US Army, and DARPA.

Technology Development Team

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Proposed Flight Experiment

Experiment Readiness:

- NLV CD will be manufactured in February/March 2013 and full-gravity deployment testing will be ready by the end of May 2013.
- The P-POD is currently ready to test (January 2013)

Test Vehicles:

- The tests will require two parabolic aircraft flights within one campaign.

Test Environment:

- NLV CD will launch on a high altitude suborbital flight in early May 2013. The P-POD has previous orbital flight heritage, but has never tested CubeSat interactions incorporating internal magnets.
- Tests require a near-zero gravity environment.

Test Apparatus Description:

Deployers

Structure for net and camera mount

Bulkhead
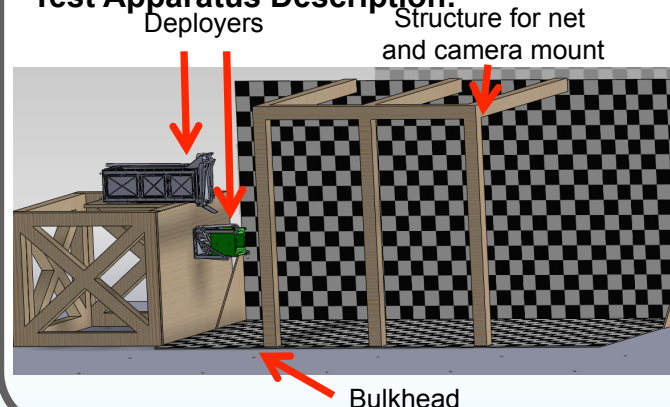
Technology Maturation

- The NLV CD must deploy CubeSats successfully in a relevant and operational environment to meet TRLs 5, 6, and 7.
- The P-POD deployment dynamics must demonstrate success within a relevant environment to meet TRLs 5 and 6.
- Following the experiment, NLV CD will be validated in an operational environment, placing it at TRL 7.
- The P-POD dynamics testing will place the system at TRL 7.

Objective of Proposed Experiment

- The first flight will record NLV CD interactions and deployment. The second flight will record both the P-POD and NLV CD systems.
- CubeSat interactions and deployment angular rates will be recorded using three high-speed cameras.
- Characterizing each system will directly benefit CubeSat developers investigating the dynamic state of their system upon deployment.

Technology Areas TA12 (2.3.1, 2.3.3, 2.3.6) and TA9 (1.4.2) are addressed.